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North Sydney NSW 2060
Australia

James King
Australian Energy Market Commission
Level 15, 60 Castlereagh St
Sydney NSW 2000

19 September 2024

RE: Tesla submission for the consultation paper on improving the cost recovery arrangements for non-network options

Dear Mr King,

Tesla Motors Australia, Pty Ltd (Tesla) welcomes the opportunity to provide the Australian Energy Market Commission (AEMC) with feedback on its consultation paper on improving the cost recovery arrangements for non-network options (NNOs).

Tesla's mission is to accelerate the world's transition to sustainable energy. A key aspect of this will be using smart, grid-forming inverters to support increased penetration of variable renewable energy (VRE) and optimise energy flows across the grid. We believe that battery energy storage system (BESS) assets, particularly Tesla Megapacks operating with our virtual machine mode (VMM) technology, will be integral to complement network build out, providing a scaled, cost-effective non-network solution alongside critical system services such as system strength.

Tesla has been an active participant in several NSP RIT-Ts to provide NNOs and is aligned with Transgrid's headline objective to improve the certainty and uptake of these processes. Tesla is strongly supportive of the AEMC's assessment criteria to consider the principles of market efficiency to provide the lowest cost outcomes for consumers. The consultation paper outlines that uncertain operating expenditure is a material barrier to NSP's uptake of non-network solutions.

However, from Tesla's experience as a proponent of NNOs, there are more impactful adjustments that can be made to the RIT-T process that drive down the pass-through costs for consumers. These include ensuring technology neutrality in the regulatory design that do not favour high-cost synchronous condensers, ensuring NNOs are not undervalued, re-evaluation of the 'total economic cost framework', and conducting the RIT-T on a reasonable timeline. More detail on these items is provided below, and previous submissions[1] [2].

Non-network options remain consistently undervalued in the RIT-T framework. To Tesla's knowledge, there have been no successful non-network solution projects completed under any RIT-T to date without requiring external funding arrangements (e.g. innovation allowances, ARENA or Government grants). This is because the RIT-T fails to value the full suite of benefits BESS provide and forces a total economic cost approach that inflates their cost relative to alternatives. We note Transgrid is currently progressing processes to procure non-network services from battery storage systems in Parkes, North West Slopes, and South West NSW – although it remains unclear the reliance of external funding sources for these preferred projects or whether they will leverage private capital as a 'sunk cost' as part the RIT-T process.

Tesla looks forward to continued engagement and actively participating in ongoing discussions to support the AEMC in the continuation of the rule change.

Kind regards,

Tesla Energy Policy Team

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[1] https://www.transgrid.com.au/media/y54k5rp4/2408-tesla-padr-submission.pdf

[2] AEMC Transmission Planning Investment Review - Consultation Paper

Opening Comments: Successful Examples

As previously mentioned, there have been several examples of non-network options progressing as the most credible option in RIT-T processes. However, these have historically required ARENA, LTESA, or alternatively rely on sunk costs from proponents (i.e. projects that are otherwise already occurring) to proceed. These include Broken Hill for a network support service for backup supply; Bathurst, Orange and Parkes areas for dynamic reactive support services' North West Slopes for battery energy storage as a service; and more. These non-network options have a lack of visibility around the funding of the projects from other proponents, ARENA grants, and NSW Electricity Roadmap subsidies. These projects are also lacking in visibility for progression relative to fully market-facing BESS projects.

As part of the funding agreement for the Wallgrove Grid Battery project, Transgrid (now under Lumea arm) commissioned independent analysis to quantify "the benefits of the regulated expenditure in the event that the R&D project successfully demonstrates the ability of batteries to provide inertia services"

As noted by Lumea, *"The Wallgrove battery is the first grid-scale battery in NSW that will pilot the use of synthetic inertia as a network service. These network services help to stabilise the grid, and will become increasingly integral to enable the increase of renewable generation to safely connect to the grid. As well as grid-scale synthetic inertia, the battery will offer energy arbitrage and FCAS market services that generators need to optimise and firm up energy supply. Research and results from the trial will be shared to support future projects and help demonstrate that battery technology is a low cost and technically viable solution to the emerging challenge created by the transformation of the generation sector."*

It is expected that the value of these services will only increase as more thermal generators retire and market changes are made to incentivise and reward all fast acting and flexible frequency, voltage and inertial responses that batteries can offer. Over time, these non-energy services should increase their proportion of the value stack, particularly as regulatory reforms unlock more markets to value the services being provided.

Effectively Valuing NNOs and Abilities of GFI

When it comes to procuring system strength or inertia services, Tesla recommends a technology neutral approach to procurement by TNSPs to prevent carte blanch determining that sycons are the best non-network solution, seeking ex-ante approval, and going out and contracting for them all; without AER having done a proper assessment of their efficient procurement. This is a risk that will only be confounded through this rule change.

Battery storage systems have proven their ability to provide all essential energy, system and network services with premium speed and accuracy. AEMO's latest white paper on advanced inverter technologies highlights the importance of inverter-based technologies, grid-forming battery storage in particular, in supporting the transition to high penetration renewable systems, and the need for new assets to provide inertia, system strength, and voltage stability in place of a retiring synchronous thermal fleet. AEMO's white paper highlights equivalent inertia capability from grid forming BESS assets as with synchronous machines[3].

[3] https://aemo.com.au/-/media/files/initiatives/engineering-framework/2021/application-of-advanced-grid-scale-inverters-in-the-nem.pdf

Figure 1: Performance Comparison of Grid-Connected Generation

Service/capability	Grid-following inverter system	Grid-forming inverter system	Synchronous machines
Can contribute to system strength		✓	✓[A]
Can have positive disturbance withstand (active power oscillation damping)		✓	✓
Can have positive disturbance withstand (fault ride-through capability)	✓	✓	✓
Can contribute to system inertia		✓[B]	✓
Can contribute to FFR	✓	✓	
Can contribute to primary frequency response	✓	✓	✓
Can support a power system island with supply balancing and secondary frequency response	✓	✓	✓
Can initiate or support system restoration	✓[C]	✓	✓

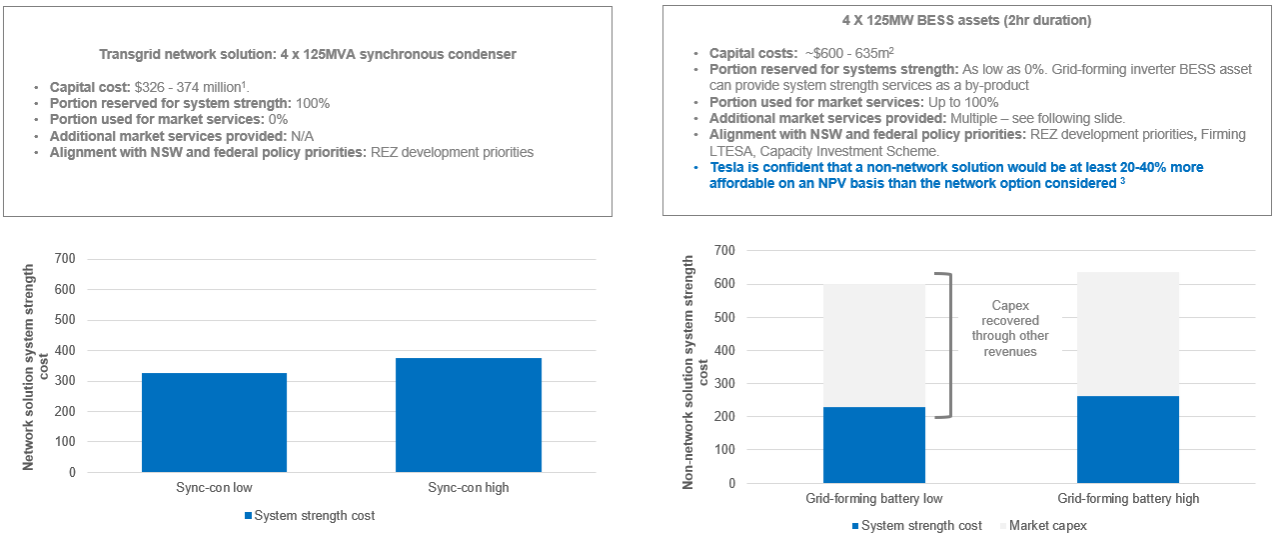
A. Synchronous machines can usually contribute to system strength much more than IBR due to their higher overload capacity.
B. A grid-forming inverter system requires energy storage to deliver inertia. See Section 2.4.
C. Grid-following inverters can support but not initiate system restoration.

Tesla has conducted a self-assessment against all elements of the AEMO Voluntary Specification for Grid Forming Inverters and confirm that we satisfy all requirements. Since VMM has now been operational at several BESS sites, Tesla has started to collect a wealth of data during real-world events which is then used to validate Tesla models that demonstrate the abilities and compliance of GFI.

However, despite the trove of evidence supporting the abilities of BESS to be credible NNOs in the RIT-T process, Tesla observes that networks strongly preference synchronous condensers, with over 14 investments proposed as part of recent PADR for non-network options in NSW. We encourage the AEMC to support regulatory changes to ensure technology neutrality for lowest cost outcomes. Worked examples on the commercial benefits of non-network solutions demonstrate that a non-network solution would be at least 20-40% more affordable on an NPV basis than the network option considered, as outlined in Tesla's submission to Transgrid's PSCR[4]:

[4] https://www.transgrid.com.au/media/kelpxss5/tesla-submission.pdf

Figure 2: Comparison of Network and Non-Network Solutions



1. Per Option 1 in the PSCR.
2. Based on AEMO ISP 2023 Inputs and Assumptions Workbook "Build Costs" tab. Assuming 2hr duration and 24/25 or 25/26 deployment timeline.
3. Dependant on TNSP WACC and IRR requirements. This is also just a best estimate, and we expect that the EOI responses received will differ from this number. Tesla is happy to work with Transgrid throughout the process to continue to build expertise on the commercial benefits of BESS assets operating as a non-network solution.

Other Barriers to NNO in the RIT-T Process

Market benefits

BESS have a proven ability to reduce prices in wholesale energy and FCAS markets. These benefits are excluded from RIT-T cost benefit options assessment due to being 'wealth transfers' but this framing ignores the benefits from improved liquidity and/or the removal of price distortions. It also likely reduces costs on other parties and consumers, for instance, through back-up plants being directed on.

Optionality

Optionality is included as part of the RIT-T assessment framework, but benefits are rarely captured. The key part of the value proposition for non-network options relative to network assets is their rapid deployment, modularity to scale up or down. This flexibility is increasingly important with uncertainty in load and generation forecasts increasing due to the transition.

Cost asymmetry

Battery storage can provide multiple services to multiple parties (system strength + energy, FCAS, inertia, FFR, etc.). AER's guidelines enforce 'total capital cost' is captured, regardless of ownership. However, this is not balanced by 'total benefits' also being captured, so BESS are severely disadvantaged. Therefore, Tesla encourages re-evaluating the total economic cost framework to address its asymmetries and posits that this constitutes a greater material barrier to NNO projects than the initial revenue uncertainty presented in the proposal. This it outlined in the example below, taken from Tesla's submission into the AEMC Transmission Planning Investment Review.[5]

[5] https://www.aemc.gov.au/sites/default/files/2021-11/EPR0087%20-%20initiation%20-%20submisssion%20-Tesla.pdf

Figure 3: Illustrative Example of Cost Treatment for Non-Network Proposal

Illustrative example of cost treatment for non-network proposal

The following example highlights the irrational treatment battery storage projects face under the current interpretation of the RIT-T framework – demonstrating the need for AER / AEMC clarity:

Project assumptions (purely illustrative):

1. Identified network need for 50MW of capacity
2. Non-network solution proposed with oversized 100MW battery system (i.e. 50% portion providing network service, 50% participating in market – and for simplicity assume market operation has no impact on network performance)

Ownership and commercial model options:

a) NSP owns battery, incurs 100% capital cost, but receives lease payments from 3rd party to use 50MW portion (e.g. TransGrid Wallgrove battery model)
b) NSP leases battery, no upfront cost incurred, and pays 3rd party a network service (opex) lease payment for 50MW portion (e.g. SIPS contract between SA Government / ElectraNet and Hornsdale Power Reserve)

There is a clear disconnect between what the cost treatment would be vs should be for these proposals
From first principles, it would make sense to partition the battery into its network and market role – and assess the true costs and benefits according to the NPS's requirement (and noting precedent set by AER for the ElectraNet ESCRI battery).

However, Tesla's understanding is that the latest guidelines (example 20 in RIT-T guidelines) are being interpreted such that the total capital costs for the oversized 100MW battery must be included under both ownership models, whilst any lease payments that 3rd parties provide are excluded as they would be considered a 'wealth transfer' (i.e. if 100MW battery costs $100m, and a 3rd party provides $50m NPV lease payments, NSP must still book $100m cost under both models (a) and (b).

Whilst this view may align with theoretical economic cost principles, it appears to directly ignore the practical market benefits of non-network solutions that would be released by consumers, network businesses, and solution providers.

Improving timelines

The RIT is no longer fit for purpose – the process takes far too long to be practical. Tesla recognises the attraction of drawing on existing regulatory frameworks, but there are major costs associated with doing so. There is a clear unevenness in the ability for prospective parties to engage in opportunities – requiring proponents to scan across a significant volume of RIT-D/T announcements, follow consultation reports through the initial, draft and final stages, and (based on our recent experiences) invest heavily in ensuring assumptions are correct, ensure technology inputs are being factored into models correctly, dedicate significant engineering capacity to support NSP engineers integrate a non-network solution into existing models, and attempt to clarify and ensure appropriate treatment of the costs and benefits under the RIT framework.

Tesla understands some of this burden will be alleviated by the AEMO centralizing the key assumptions and coordinating the initial element of the RIT-Ts for actionable Integrated System Plan projects. However, the intensive requirement on proponent's time and resourcing is still a key concern, particularly where the RIT-T may only be the first stage in determining a 'preferred option' before NSPs go to market and run additional competitive processes. In effect, this may provide additional context for why non-network proponents are dissuaded from participating in the process, despite having an optimal solution.

Resiliency benefits

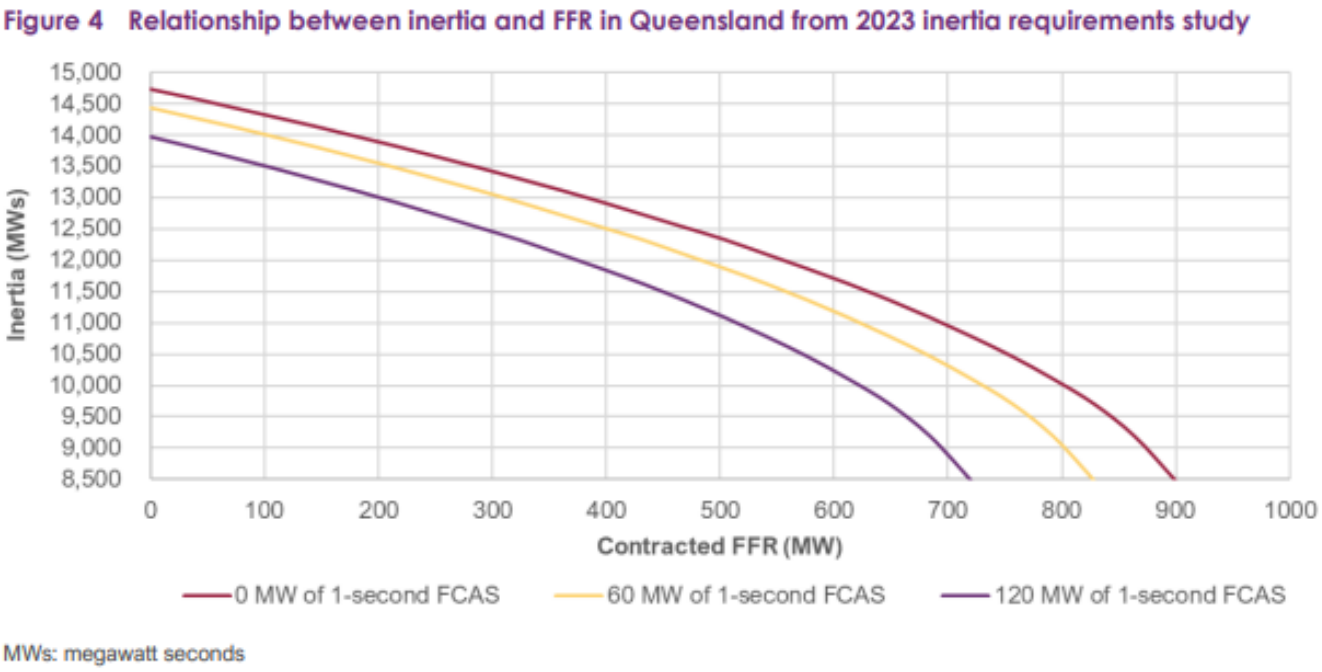
Inter-regional resiliency and planning is another prime value opportunity – storage has proven capability to provide resiliency and system security within and across regions (e.g. virtual transmission, batteries providing system restart ancillary services etc.). Since the operation of Hornsdale Power Reserve in

2017, grid-scale batteries have evidenced their premium ability to support arresting frequency in multiple system security events - a clear example of the ongoing need for network investments in batteries and the wider role 'virtual transmission' capacity can play. It remains unclear how any of this value is currently captured through the RIT framework.

Ancillary services

Battery storage projects see significant value realised in FCAS markets. RIT-Ts typically only model wholesale energy changes occurring in dispatch – considering FCAS a negligible class of market benefits. Tesla notes AEMO has identified and quantified the relationship between inertia and fast frequency response (FFR) in the inertia requirements methodology.[6] However, the benefits of providing FFR are severely undervalued in the RIT-T process despite AEMO's demonstration on understand how inertia requirements could be substituted by procuring 1-second FCAS, both of which BESS are able to provide as an NNO.

Figure 4: Relationship between Inertia and FFR in QLD from 2023 Inertia Requirements Study



Alignment with other policy objectives

Tesla notes that given GFI's ability to provide multiple benefits from a single asset, procurement of NNOs enables multiple state and federal policy objectives to be achieved.

[6] AEMO's Amendments to the Inertia Requirements Methodology consultation paper

Figure 5: Alignment of NNO with State and Federal Policy Outcomes

Policy framework	Non- network solution (grid forming battery)	Network solution (synchronous condenser)
NSW Energy Security Target	A key component of the NSW Energy Security Target is the requirement for 2GW of storage capacity being built in NSW. By using batteries with grid-forming inverters, these assets can also be making a positive contribution to the NSW Energy Security Target and reducing the need for additional investment in storage through the long-duration storage LTESA mechanism.	Does not support the Energy Security Target
Firming LTESA	Related to the above, the NSW Government is also opening the Firming LTESA competitive tender process at the beginning of April. This tender will seek at least 380MW of firming capacity which may include grid-forming batteries. That capacity is required to be commissioned by 1 December 2025 which perfectly serves the Transgrid timelines. Given the timelines there is potential for an overlap in projects providing an EOI response to Transgrid and also tendering in the firming LTESA process. Similarly those projects that are successful in the firming LTESA process will likely be suitable for providing system strength support regardless of whether they've submitted an EOI.	No overlap between firming LTESA process and the proposed network solution.
NSW REZ development	Each of the NSW renewable energy zones has their own developmental requirement and are looking at some form of system strength support – be it through network or non-network solutions. Grid-forming batteries provide one option for supporting REZ development.	Both network and non-network options are being considered in the REZ development ongoing work.
Federal Capacity Investment Scheme	A federal capacity investment scheme will likely drive the uptake of additional storage capacity including the potential for grid forming inverters across NSW. These can be used to support system strength in the state.	Synchronous condensers are not considered as capacity and will not be an eligible technology under the capacity investment scheme.